

Wind turbine measuring wind speed

Why is measuring wind speed so important?

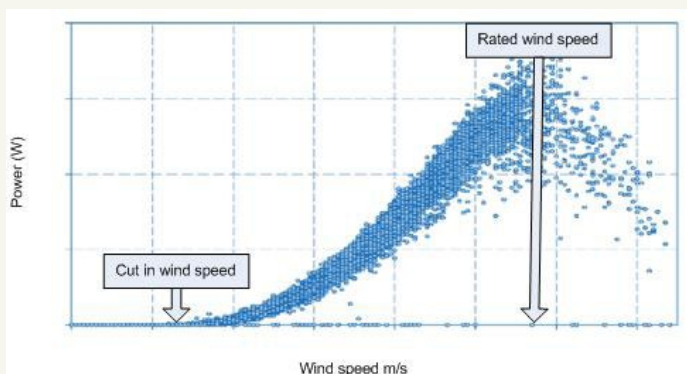
The amount of electricity a wind turbine can generate depends on the local wind speed. The wind speed itself depends on a number of factors such as:

- where you are in the UK
- whether there are any obstructions such as trees and buildings nearby (which slow the wind down and cause turbulence)
- the height above ground level: wind speeds increase with height so that the higher a turbine is the more electricity it is likely to produce.

The location of a wind turbine is therefore crucial for maximising its overall performance.

Although the power carried by the wind is proportional to the cube of the wind speed, the actual power output delivered by a wind turbine is more complex. Power output is zero up to the 'cut in' wind speed - the speed at which power is generated - and flat above the 'rated' wind speed. However, between the 'cut in' and 'rated' wind speeds, the power output is roughly proportional to the cube of the wind speed. The diagram below illustrates this (wind speeds vary for each turbine).

Therefore it is crucial to measure the wind speed before installing a turbine to make sure it will be financially worthwhile.



How can I measure the wind speed?

As a first step we recommend that you use our [Wind Speed Prediction Tool](#). This tool (which is very easy to use) provides an estimated wind speed when you put in your postcode and the type of area you live in. The tool enables you to find out quickly whether the wind at the site you are interested in is strong enough to warrant further investigation.

We do not recommend installing a domestic small scale wind turbine in areas with wind speeds of less than 5 metres per second (5m/s) as speeds less than this are unlikely to provide a cost-effective way of producing electricity with current technologies.

If the Wind Speed Prediction Tool predicts that the wind speed at the location selected is 5m/s or above, and if the

project still looks viable the next step is to check the wind speed predictions using an anemometer or wind gauge. You should do this for at least three months and ideally for twelve months or more. If you measure wind speeds for less than six months, you will need to apply a seasonal adjustment factor as wind speed varies by season.

What is an anemometer?

Anemometers can also make use of ultrasound sonic waves rather than cups. Handheld anemometers that have a built-in impeller to measure wind speed

can also be purchased. However, these are not designed for assessing whether a site has sufficient wind for a turbine as they can provide only intermittent data.

The purpose of the anemometer is to measure average, minimum and maximum wind speed as well as how much turbulence there is at the site. If two anemometers are put at different heights on the same mast this provides useful additional information about the wind shear - the difference in wind speed at different heights. They can also provide useful information about the intensity of any wind turbulence at the site.

You will also need to measure wind direction. You can do this by using a separate weathervane (also called a wind vane or direction indicator) although some anemometers include a direction indicator, such as the Power Predictor and Pro Anemometer referred to below. Ultrasonic devices can also have built-in wind direction monitors, although these are more expensive.

The pole, anemometer and wind vane equipment are often referred to as a meteorological mast or met mast for short. Information on wind speed and direction is collected by a data logger and can be analysed using computer software. The wind data collected also needs to be cross-checked for accuracy against data from a nearby Met Office weather station.

More professional data loggers not only measure wind speeds but also do real-time calculations with that data over regular intervals, usually set at 10 minutes. These calculations include the average and maximum wind speeds over the interval selected.

The ideal scenario is to have anemometer sited at the same site and height as the hub of the proposed wind turbine, so you can leave it in situ while the wind speed is being monitored.

How do I measure wind speed with an anemometer?

If you want to measure the wind speed you can:

- ✔ buy an anemometer and a data logger and interpret the data yourself, or
- ✔ instruct a consultant or installer to do this for you - the bigger the potential investment the more likely it is to be worth your while employing an experienced third party to do this work for you.

If you are already in contact with an MCS-certified installer this is something that you could discuss with them. MCS-certified installers are required by the Microgeneration Installation Standard ([find out about MIS 3003 at the MCS website](#)) on small wind turbine systems to undertake a three-step calculation to assess the likely performance of a wind turbine. The installation of an anemometer is not a requirement of MCS although it does state that 'accurate measurement over a period of one year is the preferred method for determining the actual wind speed in a given location and should always be considered.'

Where can I buy an anemometer?

If you want to measure the wind speed yourself, there are a number of companies that manufacture and sell anemometers – from those which can be handheld to those with an international calibration certificate. Here are some samples:



Product	Type	Features	Indicative cost including VAT	Suppliers
Power Predictor	Cup anemometer for pole mounting	Measures wind speed and direction, solar potential, data logger, two-year software licence	£250	Better Generation
Pro Anemometer and LeWL data logger	Cup anemometer for pole mounting	Measures wind speed and direction, data logger	£310 to £340	Logic Energy or Skyview Environmental
NRG-1900 # 40 anemometer	Calibrated three-cup anemometer for pole mounting	Measures wind speed (weather vane for measuring wind direction and data logger can be purchased separately)	£257 plus £185 for weather vane	Wind and Sun or Logic
WindSonic 1 Sensor	Ultrasonic for mounting on a pole	Measures wind speed and direction, can be linked to a data logger and display unit which can be purchased separately. Free software.	£680	Richard Paul Russell Ltd

Please note that the Energy Saving Trust makes no endorsement of any of these products and makes no comment on their suitability of each for measuring wind speed for a wind turbine project.

Do I need planning permission to put up a met mast?

You should contact your local planning authority before installing a met mast to find out whether you need to make a formal application for planning permission.

